DOCUMENT RESUME

ED 230 738 CE 036 154

AUTHOR Buckley, Elizabeth; Johnston, Peter
TITLE Pilot Project in Computer Assisted Instruction for Adult Basic Education Students. Adult Learning Centers, the Adult Program, 1982-83.
INSTITUTION Great Neck Public Schools, N.Y.
SPONS AGENCY New York State Education Dept., Albany. Bureau of Community and Continuing Education Program Services.
PUB DATE 83
NOTE 35p.; For a related document, see ED 197 202.
PUB TYPE Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Achievement; *Adult Basic Education; Adult Students; Affective Behavior; *Attitude Change; *Computer Assisted Instruction; *Program Effectiveness; Program Evaluation; Student Attitudes
IDENTIFIERS 310 Project; *Great Neck Adult Learning Centers NY; New York (Great Neck)

ABSTRACT

In February 1977, computer assisted instruction (CAI) was introducted to the Great Neck Adult Learning Centers (GNALC) to promote greater cognitive and affective growth of educationally disadvantaged adults. The project expanded to include not only adult basic education (ABE) students studying in the learning laboratory, but also ABE students studying within group instructional classroom settings. The GNALC became a regional center of CAI use with hook-ups at four adult centers. ABE students from the GNALC used six courses as a core part of their basic skills program: adult reading skills, adult arithmetic skills, adult language skills, fundamentals in English, critical reading skills, and problem solving. A 1982-83 study was conducted to generate insight into the cognitive and affective effects of CAI on ABE students. It concerned itself with the extent of CAI utilization, cognitive growth, and affective change of students who used CAI for 5 hours or more during the year. Study results confirmed the conclusion drawn from previous years of study that the use of CAI leads to significant cognitive and affective growth. (The report is divided into an analytical summary and a general report that provides more detail.) (YLB)

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ED230738

PILOT PROJECT

IN

COMPUTER ASSISTED INSTRUCTION

FOR

ADULT BASIC EDUCATION STUDENTS

ADULT LEARNING CENTERS, THE ADULT PROCRAM

GREAT NECK PUBLIC SCHOOLS, GREAT NECK, NY

1982 - 83

U.S. DEPARTMENT OF EDUCATION
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CE036154

This pilot project in Computer Assisted Instruction is primarily funded by Title XIII - 310 Special Project Funds granted by the Bureau of Community and Continuing Education-Program Services, Division of Continuing Education, New York State Education Department, Albany, New York.

The opinions expresses herein do not necessarily reflect the position or policy of the New York State Education Department and no official endorsement by the New York State Education Department should be inferred.

ACKNOWLEDGEMENTS

NEW YORK STATE EDUCATION DEPARTMENT

Mr. James A. Kadamus, Assistant Commissioner for
Occupational and Continuing Education
Mr. Garrett W. Murphy, Director
Division of Continuing Education
Dr. Russell J. Kratz, Acting Chief
Bureau of Community and Continuing Education
Mr. Neil W. Carr, Supervisor
Bureau of Community and Continuing Education
Ms. Jean Napper, Associate
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Dr. George J. Kawas, Associate
Bureau of Community and Continuing Education

Appreciation is expressed to the Division of Continuing Education for their continued support and assistance in the implementation of the Computer Assisted Instruction Project.

GREAT NECK PUBLIC SCHOOLS

Dr. William A. Shine, Superintendent of Schools

Mr. Lawrence R. Gross, President, Board of Education

Dr. David Rauch, Director of Adult Education

Mr. Jay Waxenberg, Director of Special Services

Appreciation is expressed to the Board of Education and administrators of the Great Neck Public Schools for their continuing support of the Adult Basic Education Program.

ADULT LEARNING CENTERS

Mr. Peter Johnston, Project Coordinator

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Mrs. Marie Heath, Learning Laboratory Supervisor

Ms. Gail Cruise, Media Specialist

Deepest appreciation is expressed to Peter Johnston, Project Coordinator, and other project staff for their contributions to the success of this project as well as to the entire staff of the Adult Learning Centers.

SUPPLIERS OF COMPUTER HARDWARE AND SOFTWARE

Instruction Systems, Inc., Englewood, New Jersey
Computer Curriculum Corp., Palo Alto, California

TABLE OF CONTENTS

	Page (s)
Funding Acknowledgement	i
Acknowledgements	ii
Table of Contents	iii
PART I - ANALYTICAL SUMMARY	
Overview	1
History of Project	1
Current Study	1
Computer Assisted Instruction (CAI): What Is It?	2
Computer Assisted Instruction Curriculum	2
CAI Student/System Operating Procedures	2
Staffing	2
Evaluation Design	3
Matched Objectives and Outcomes	3
Conclusions and Recommendations	4
PART II - GENERAL REPORT	
Overview of Adult Learning Centers	5
History of the Project	5-6
Current Study	7
Computer Assisted Instruction (CAI): What Is It?	8
CAI Curriculum	8-9-10-11-12
CAI Student/System Operating Procedures	13
Staffing	14-15
Objectives of Study	16
Evaluation Design	17-18
Matched Objectives and Outcomes	19-20
Findings: Cognitive and Affective	21-22-23-24-25
Conclusions and Recommendations	26-27-28
PART III - APPENDIX	
Appendix #1 - CAI Visitors	29-30-31
Appendix #2 - Adult Reading Skills	32
Appendix #3 - Adult Arithmetic Skills	33
Appendix #4 - Adult Language Skills	34
Appendix #5 - Fundamentals of English	35-36
Appendix #6 - Critical Reading Skills	37
Appendix #7 - Problem Solving	38
Appendix #8 - Survival Skills	39-40
Appendix #9 - Exploring Careers	41
Appendix #10 - GED	42-43-44-45-46
Appendix #11 - CAI Attitudinal Questionnaire with Results	47-48-49-50
Appendix #12 - Letters from Visitors	51-52-53-54-55 56-57-58

PART I

ANALYTICAL SUMMARY

ANALYTICAL SUMMARY

SIGNIFICANT FINDINGS OF THIS PROJECT

Overview

The Great Neck Adult Learning Centers offers a variety of services for the educationally disadvantaged adult. Programs are offered in English as a Second Language (ESL), Adult Basic Education (ABE) High School Equivalency Preparation (HSE), and the External High School Diploma Program (EDP). Instruction takes place both day and evening within both individualized learning laboratories and group instructional classroom settings. In addition, vocational and educational counseling services are also offered.

History of Project

In February 1977, Computer Assisted Instruction (CAI) was introduced to the Great Neck Adult Learning Centers in order to promote greater cognitive and affective growth. A three year pilot project was implemented to evaluate the effectiveness of Computer Assisted Instruction with Adult Basic Education students.

CAI was originally utilized only by Adult Basic Education students studying in the Learning Laboratory. Results from the first year of CAI use were so positive that the project was continued and expanded to include Adult Basic Education students studying within group instructional classroom settings. During the 1979/80 school year, the Adult Learning Centers received a new computer, an expanded curriculum and four new terminals which were installed in a satellite center where they were utilized by elementary school children in the daytime and Adult Basic Education students at night. The program was again expanded during the 1981-82 year by means of increased curriculum, and hook-ups with two additional adult centers in New York City.

Current Study

During the 1982-83 school year, the Great Neck Adult Learning Centers grew in its role as a regional center of CAI use. Hook-ups at York College, BHRAGS and a satellite of the GNALC continued. Numerous visitors, including representatives of three State Education Departments, visited the center to learn more about CAI. In the spring, the Adult Learning Centers hosted and chaired a symposium of CAI users from around New York State.

CAI use at the Adult Learning Centers continued its steady growth. CAI was utilized on a weekly basis for a total of five or more hours during the school year by an "Experimental Group" of 170 ABE students with entry reading scores between 2.5 and 8.0. Of these students 125 were women and 45 were men. They ranged in age from 17 to 68.

In addition CAI was utilized by a small number of ESL students in their study of language arts. Numbers of ABE, HSE and EDP students used CAI on a part time basis to meet specific needs including courses such as GED, Survival Skills and Exploring Careers. In all, about 450 students used CAI during the school year.

Computer Assisted Instruction (CAI) - What Is It?

Computer Assisted Instruction is a computer/video display terminal system that incorporates programmed instructional materials and is used as a supplementary learning tool for students from both classroom and learning laboratory educational settings.

The Computer Assisted Instruction system utilizes the powers of the computer to:

1. Diagnose skill areas in need of improvement.

2. Present individually appropriate material designed to improve and reinforce skills.

3. Maintain detailed records of the student's progress through the programmed curriculum.

Computer Assisted Instruction Curriculum

Adult Basic Education students from the Great Neck Adult Learning Centers used the following six courses as a core part of their basic skills program:

... Adult Reading Skills (ARS)
... Adult Arithmetic Skills (AAS)
... Adult Language Skills (ALS 1)
... Fundamentals in English (FUN)
... Critical Reading Skills (CRS)
... Problem Solving (PS)

These courses can be classified as either "strand oriented" (drill and practice) or "lesson oriented" (instructional). Other CAI courses such as Survival Skills, Exploring Careers and GED were also utilized to meet specific student needs.

Computer Assisted Instruction Student/System Operating Procedures

All students received Computer Assisted Instruction lessons by means of one of the video terminals. The computer presents appropriate material to the student and then provides immediate feedback to the student's response.

The system automatically moves students to more difficult or easier material according to the student's performance. At the end of each lesson, it provides both student and teacher with a detailed diagnostic summary of the student's performance.

Staffing

The Computer Assisted Instructional staff consists of a Project Coordinator and a Project Aide. They have primary responsibility for Computer Assisted Instruction. The Learning Laboratory staff has been oriented to the system's operation and is competent in all aspects of its use. In addition, the entire Adult Learning Center staff has participated in ongoing orientation as to its curriculum and usage.

Evaluation Design

This study was designed to generate insight on the effect, both cognitive and affective, of Computer Assisted Instruction on Adult Basic Education students. The study will concern itself with the following areas:

1. Extent of CAI utilization.

2. Cognitive growth. (As measured by pre and post test scores on standardized achievement tests in reading and mathematics.)

3. Affective change. (As measured by questionnaire responses and group and individual interviews.)

The study will include an Experimental Group made up of those students who utilize CAI for five hours or more during the year as part of their weekly study of reading, language arts and/or arithmetic.

Matched Objectives and Outcomes

Objectives	Outcomes
Utilization To provide weekly CAI utilization for a minimum of 150 ABE students, Experimental Group, each of whom will spend a minimum of five hours studying reading, language arts and/or arithmetic on CAI during the school year.	A total of 170 ABE students were in the Experimental Group, which consisted of those students who utilized CAI for a minimum of five or more hours in their weekly study of reading, language arts and/or arithmetic.
To provide CAI utilization for a minimum of at least 300 ABE and ESL students during the year as one component of their basic study program in reading, language arts and/or arithmetic.	A total of 450 ABE and ESL students utilized CAI during the year as one component of their basic study program in reading, language arts and/or arithmetic.
Cognitive To determine if Learning Laboratory students in the Experimental Group average gains of 2.5 years of growth or better on standardized achievement tests in both reading and mathematics.	Learning Laboratory students in the Experimental Group averaged 3.71 years of growth in reading and 3.55 years of growth in mathematics. Lab Experimental Reading 3.71 Mathematics 3.55
To determine if class students in the Experimental Group average gains of 2.0 years of growth or better on standarized achievement tests in reading.	Class students in the Experimental Group averaged 3.32years of growth in reading. Class Experimental Reading 3.32

Matched Objectives and Outcomes

Objectives	Outcomes
Affective To determine if Learning Laboratory students in the Experimental Group average 50% more hours of attendance than those Learning Laboratory students who do not utilize CAI.	Learning Laboratory students in the Experimental Group averaged 196 hours of attendance as compared to 108 hours of those Learning Laboratory students who did not utilize CAI. The Experimental Group had 80% more hours of attendance. Lab. Exp. Attendance 196 hours Non CAI Users Attendance 108 hours Difference 80%+ hours
To determine if students utilizing CAI express positive attitudes towards CAI, towards learning and towards their rate of progress.	Students utilizing CAI expressed very positive attitudes towards CAI, towards learning and towards their rate of progress. 98% "enjoyed" CAI 73% feel "more confident" than before. 96% feel their progress is "OK"or "very good".
To determine if students utilizing CAI become more self-directed in their learning styles, i.e., learn to use specific lessons on CAI to meet their particular needs and use CAI to diagnose other needs.	Students utilizing CAI became more self-directed in their learning styles, i.e., learned to use specific lessons on CAI to meet their needs and use CAI to diagnose other needs. In courses offering a choice of lessons or topics: 77% of students chose lessons or topics to meet their particular needs. Specific areas of improvement were identified by: 48% of respondents using reading courses. 70% of respondents using language arts courses. 98% of respondents using arithmetic courses.

Conclusions and Recommendations

The results of the current study confirmed the conclusion drawn from previous years of the study that the use of Computer Assisted Instruction leads to significant cognitive and affective growth. In both structure and design, Computer Assisted Instruction appears to be an ideal supplementary learning medium for Adult Basic Education students. New courses have made CAI relevant to a wider range of students with more diverse individual needs; however, there still exists a need for a good affordable curriculum for students of English as a Second Language and for beginning readers. Regional hookups, such as the ones from Great Neck to both York College and BHRAGS, represent the most cost effective way to bring Computer Assisted Instruction to more Adult Basic Education students and should be expanded. Meetings of CAI users, such as the symposium held at the Clover Drive Center in June 1983, are important opportunities for adult educators to become more effective users of CAI and should be continued.

PART II

GENERAL REPORT

OVERVIEW OF ADULT LEARNING CENTERS

The Adult Learning Centers of the Great Neck Public Schools provide adults who return to school to complete their education with a variety of courses and services. Courses are offered in Basic Education (ABE) including reading, mathematics, language arts and communication skills, English as a Second Language (ESL), High School Equivalency (HSE) and External Diploma Program. Trained counselors provide both educational and vocational counseling. Included as a central component of the counseling program is the highly specialized Life Skills Employability Program which assists adults in meeting their present and future educational and vocational goals.

Instruction is offered both day and evening at various sites throughout the district. The instructional program takes place in classroom settings and individualized learning laboratories. The learning environment that students study within varies according to their instructional program. ABE students have the option of attending either a classroom (group instruction) or Learning Laboratory environment. ESL students study principally within classroom settings. HSE students study principally within a diagnostic/prescriptive model.

HISTORY OF THE PROJECT

During the 1976/77 year, the Great Neck Adult Learning Centers became one of two Adult Basic Education programs in New York State to be chosen by the Unit of Basic Continuing Education, Division of Continuing Education, New York State Education Department, to field test a pilot project utilizing Computer Assisted Instruction with Adult Basic Education students. What started as a very experimental project for a relatively small number of ABE students from the Centers' Learning Laboratory has grown and expanded and become a central part of the Adult Basic Education program in Great Neck. By all standards, the program has grown tremendously since its inception.

In February of 1977 a computer, six video display terminals and a printer were installed in the Learning Laboratory of the GNALC. The computer system featured reading, language arts and arithmetic courses specifically designed for Adult Basic Education students.

In November 1979, this system was replaced by a new computer, eight terminals, mini ace and printer. The new system featured expanded curriculum which provided students with more options.

In April 1980, four terminals were installed in a satellite center of the Great Neck Adult Learning Centers. These terminals, which were connected by telephone to the computer in the Learning Laboratory, were used by elementary school students in the day in conjunction with a Title I math program and by Adult Basic Education students at night. This was the first opportunity to involve students outside of the main Learning Center in CAI use.

In November 1981, new curriculum again became available, including courses in Survival Skills and Exploring Careers which moved beyond the basic skills model to provide instruction in areas of vital importance to adults. At the same time, the Great Neck Adult Learning Centers became a regional center with hookups at York College in Queens and BHRAGS in Brooklyn making CAI available to even larger numbers of students.

Changes in equipment and curriculum were matched by growth in the number of students utilizing CAI. From February 1977 to June 1978, CAI use was limited to students from the individualized Learning Laboratory. In the 1978/79 school year, students from Adult Basic Education classes were given their first opportunity to utilize CAI on a regular basis. The Experimental Group, made up of those ABE students for whom CAI was a core part of their study of reading, language arts and/or arithmetic, consisted of only 60 students during the initial evaluation period. With the addition of ABE class students, this number grew to 100 in 1978/79, and 156 by 1981/82.

During the first three and one half years of CAI use, the program's effectiveness was evaluated by comparing the performance of students utilizing CAI with the performance of Control Groups made up of students without access to CAI. Students utilizing CAI consistently showed significantly greater cognitive growth, as measured by progress on California Achievement Tests in reading and mathematics, than students in the same program without access to CAI or Adult Basic Education students statewide. In fact, in many cases average levels of growth for CAI Experimental Group students more than doubled statewide norms. In order to allow all ABE students in the Great Neck Adult Learning Centers to use CAI and because past studies had already proven the effectiveness of CAI, the evaluation design was changed in 1980/81 to eliminate the need for a Control Group. Cognitive growth was then measured against pre set expected levels of growth determined in conjunction with officials from the Bureau of Community and Continuing Education.

In addition, students utilizing CAI consistently had 50% to 80% greater attendance than students in the same program who did not utilize CAI. In group and individual interviews and in response to questionnaires, students who utilize CAI have consistently indicated that they enjoy using CAI and feel they learn well with it. Furthermore, it seems to aid Adult Basic Education students in becoming less teacher dependent and in developing a more self directed learning style.

Project results have been disseminated at local, state and national conferences including the National Adult Education conferences in St. Louis in 1980 and Anaheim in 1981.

CURRENT STUDY

During the 1982-83 year, the Great Neck Adult Learning Centers grew in its role as a regional center of CAI use. Hookups with York College and BHRAGS continued for the second year. More significantly, the project staff expanded its role as a resource for adult educators. More than in any previous year, the Program Director and Project Coordinator answered phone and mail requests for information and hosted adult educators eager to learn more about the use of CAI with adults. Visitors included representatives of three State Education Departments and the office of the Mayor of New York City. In the spring, the ALC organized, hosted and chaired a symposium of CAI users from throughout New York State in an effort to give everyone the opportunity to share concerns and to learn from each other's experience. (See Appendix #1 for a complete list of people who requested information on the project, visited the center or attended the symposium). This is all part of the dissemination role of being a regional center and is a responsibility taken very seriously by project staff.

CAI continued to be a great success within the Adult Learning Centers as well. The Experimental Group, made up of those students who utilized CAI on a weekly basis in their study of reading, language arts and/or arithmetic consisted of 170 students compared to 156 a year ago. Of these students, 83 studied primarily in the individualized learning laboratory and 87 studied primarily in classroom settings. As in past years, most Learning Laboratory students utilized CAI in their study of reading, language arts and arithmetic while most class students utilized CAI only in their study of reading and language arts. These 125 women and 45 men ranged in age from 17 to 68 and had entry reading scores between 2.5 and 8.0.

Once again, larger numbers of students utilized CAI on a part time basis to meet specific needs. A small number of ESL students again utilized CAI in their study of language arts. A number of ABE, HSE and EDP students utilized CAI on a part time basis to meet specific needs, but were not included as part of the Experimental Group. Some of these students utilized specific lessons from basic skills courses such as Adult Arithmetic Skills, Problem Solving, Fundamentals of English and Critical Reading Skills to meet specific needs. Others utilized courses such as Survival Skills, Exploring Careers and GED. In all, about 450 students utilized CAI during the year.

COMPUTER ASSISTED INSTRUCTION (CAI):

WHAT IS IT?

Computer Assisted Instruction is a computer/video display terminal system that incorporates programmed instructional materials and is used as a supplementary learning tool for students from both classroom and learning laboratory educational settings.

The Computer Assisted Instruction system utilizes the powers of the computer to:

1. Diagnose skill areas in need of improvement.
2. Present individually appropriate material designed to improve and reinforce skills.
3. Maintain detailed records of the students' progress through the programmed curriculum.

CAI CURRICULUM

Adult Basic Education students from the Great Neck Adult Learning Centers primarily used the following six CAI courses:

Adult Reading Skills (ARS)
Adult Arithmetic Skills (AAS)
Adult Language Skills I (ALS I)
Fundamentals of English (FUN)
Critical Reading Skills (CRS)
Problem Solving (PS)

These courses can be classified as either <u>strand oriented</u> or <u>lesson oriented</u>. Several other courses were added during the school year, most importantly Survival Skills (SS), Exploring Careers (EX), and GED.

<u>Strand oriented</u> courses are presented by means of ten minute lessons each consisting of questions from a variety of strands, or skill areas. The student progresses at his or her own rate. Correct answers lead to progressively more difficult questions. Incorrect answers cause the student either to remain at the present level or to be moved to less difficult work.

<u>Lesson oriented</u> courses are broken down into many lessons, each presenting material on one particular skill. The student can either go through the lessons in the order they are offered or can override the system and do only those particular lessons he or she especially needs. Lesson oriented courses are presented in twenty minute lessons. Each student is allowed a maximum of five courses.

Below are CAI courses with their characteristics and skill areas:

Adult Reading Skills

The curriculum is divided into five strands. In any particular session the student will receive questions from all five skill areas. It begins with single sentence items and builds to paragraphs. Substantial portions of the curriculum introduce vocabulary related to consumer education. Adult Reading Skills consists of the following skills: (see Appendix #2).

a) Word Attack
Suffixes, prefixes, root words, compounds, contractions.

b) Vocabulary Study
Homonyms, synonyms, antonyms.

c) Literal Comprehension
Categories, transformations, questions and answers.

d) Interpretive Comprehension
Fact and opinion, preliminary inference, character study, analogies, slanted writing, metaphors, similes.

e) Work Study Skills
Alphabetizing, finding information.

Adult Arithmetic Skills

The curriculum is divided into eight strands. At a given session, a student will encounter problems at different levels of complexity from each strand, the level being determined by the student's achievement in each strand. Furthermore, a student may choose to drill on one particular skill for the entire ten minute lesson. Adult Arithmetic Skills consists of the following skills: (see Appendix #3)

a) Addition.
b) Subtraction.
c) Multiplication.
d) Division.
e) Equations.
f) Fractions.
g) Measurements.
h) Decimals.

Adult Language Skills I

The curriculum is divided into eight strands plus a review strand. In any particular session the student will receive questions from all eight skill areas. Adult Language Skills I consists of the following skills: (see Appendix #4).

a) Principal Parts of Verbs.

b) Verb Usage.

c) Subject-Verb Agreement.

d) Pronoun Usage.

e) Contractions, Possessives and Negatives.

f) Modifiers.

g) Sentence Structure.

h) Mechanics (capitalization, punctuation).

i) Topics (a special review strand).

Fundamentals of English

The curriculum is divided into six chapters, which are subdivided into a total of 57 lessons. In any particular session the student studies lessons, each of which provide instruction in one particular skill area. The student can choose specific lessons or can study them in the order in which they are presented on the system. Fundamentals of English consists of the following skills: (see Appendix #5)

a) Parts of a Sentence.

b) Sentence Fragments.

c) Run on Sentences.

d) Verb Usage.

e) Double Negatives.

f) Subject - Verb Agreement.

Critical Reading Skills

The curriculum is divided into lessons made up of vocabulary study and reading comprehension. Students may choose to take lessons with both vocabulary and comprehension or they may choose to drill on only one area. The comprehension study is based on reading from a supplemental text. Critical Reading Skills consists of: (see Appendix #6).

a) 240 Lessons of Vocabulary Study

b) 150 Passages for Reading Comprehension

Problem Solving

The curriculum is divided into seven strands. In any particular session the student may receive questions from a variety of skill areas or may choose to drill on only one particular skill. Problem Solving consists of the following skills: (see Appendix #7).

a) How Many.

b) Money.

c) Mystery Numbers and Age Problems.

d) Measure.

e) Number Systems.

f) Time, Rate and Distance.

g) Geometry.

Several other courses were used during the school year to meet needs not adequately met by the basic skills courses described above. The most significant of these were Survival Skills (SS), Exploring Careers (EX) and GED.

The Survival Skills curriculum is divided into six chapters, called modules, which are subdivided into a total of 50 lessons. In any particular session the student studies lessons, each of which presents material followed by exercises relevant to a particular subject area. The student can choose specific lessons or can study them in the order in which they are presented on the system. Additionally, the student can choose exercises which require only reading, only mathematics or both reading and mathematics.

Survival Skills presents material in the following content areas: (see Appendix #8).

a) Health and Nutrition.

b) Consumer Skills.

c) Employment.

d) Personal Finance.

e) Information Sources.

f) Transportation and Entertainment.

Exploring Careers is a comprehensive, centralized source of information about occupations and the world of work. It is designed to help students identify suitable occupational choices based on interests and abilities. It is different from other CAI courses in that its goal is to provide information and help students make informed choices rather than to help them improve specific academic skills. Exploring Careers can be utilized via one of three modes: (see Appendix #9).

a) Job Express for the student who has tentatively chosen a specific job and needs more specific information about that particular job.

b) Job Explore for the student who has tentatively chosen a particular "work group" area (artistic, mechanical, selling) and needs information about specific jobs in that field.

c) Job Select for the student who is beginning his or her career exploration and needs to match interests and abilities to a specific work group.

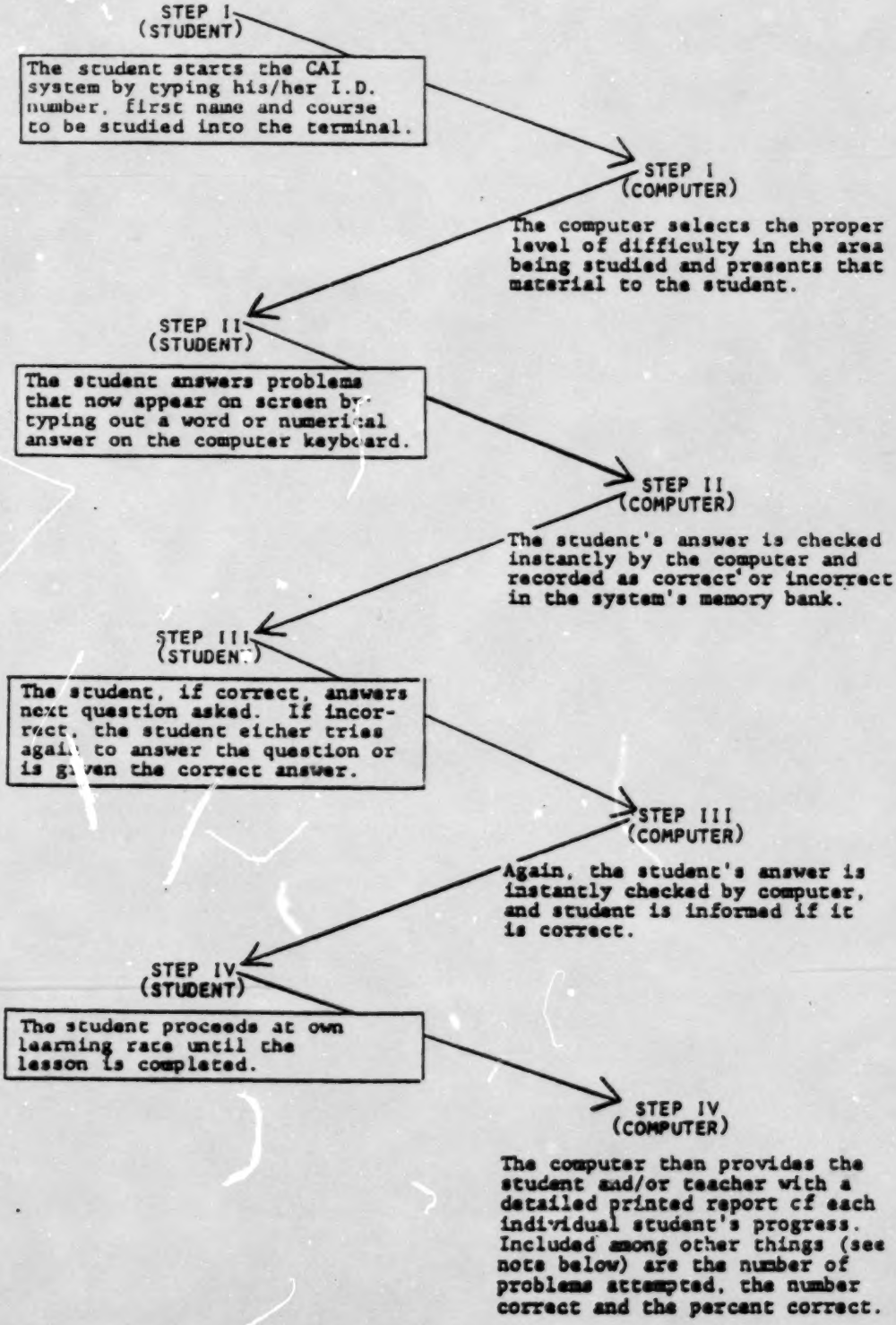
Exploring Careers has been utilized in conjunction with the Life Skills Employability Program at the Adult Learning Centers.

The GED curriculum is divided into five sections corresponding to the sections on the High School Equivalency Examination. Each section is further broken down into anywhere from fifty to eighty lessons and the student is able to choose only those lessons he or she wishes to study. Most sections require a supplemental text. GED consists of the following sections: (See Appendix #10)

a) GED English
b) GED Social Studies
c) GED Natural Science
d) GED Literature
e) GED Mathematics

COMPUTER ASSISTED INSTRUCTION STUDENT/SYSTEM OPERATING PROCEDURES

All students receive CAI lessons by means of one of six video display terminals located in the central Learning Laboratory of the Adult Learning Centers. The general procedure adhered to by students as they engage with the CAI system is as follows:


STEP I (STUDENT)
The student starts the CAI system by typing his/her I.D. number, first name and course to be studied into the terminal.
STEP I (COMPUTER)
The computer selects the proper level of difficulty in the area being studied and presents that material to the student.
STEP II (STUDENT)
The student answers problems that now appear on screen by typing out a word or numerical answer on the computer keyboard.
STEP II (COMPUTER)
The student's answer is checked instantly by the computer and recorded as correct or incorrect in the system's memory bank.
STEP III (STUDENT)
The student, if correct, answers next question asked. If incorrect, the student either tries again to answer the question or is given the correct answer.
STEP III (COMPUTER)
Again, the student's answer is instantly checked by computer, and student is informed if it is correct.
STEP IV (STUDENT)
The student proceeds at own learning rate until the lesson is completed.
STEP IV (COMPUTER)
The computer then provides the student and/or teacher with a detailed printed report of each individual student's progress. Included among other things (see note below) are the number of problems attempted, the number correct and the percent correct.

NOTE: Additionally, the report provides information on progress in specific skill areas and the percentage of the course completed in each skill area.

STAFFING

There are two full time staff members for the Computer Assisted Instruction project, the Project Coordinator and the Project Aide.

In choosing these staff members, experience in Adult Basic Education and a proven ability to work with the Adult Basic Education students were considered more important than previous experience working with computers. In fact, neither of the project staff had any prior experience with the use of computers in education. Both were trained in a brief intensive workshop and provided with ongoing support by the system's vendor.

It was the responsibility of the Project Coordinator to perform the following functions:

a) Make educational decisions about the appropiateness of various courses for particular students.

b) Assign appropriate non-CAI materials to the student based on diagnostic information from the system.

c) Communicate student needs, as diagnosed by the system, to Learning Laboratory and classroom teachers.

d) Conduct individual and group interviews with students to gain feedback and answer questions related to the use of CAI.

e) Schedule Learning Laboratory and Classroom students' use of CAI to make maximum use of the system, and coordinate schedules with Learning Laboratory and Classroom Teachers.

f) Supervise enrollment procedures and collection of data from the system.

g) Enroll and instruct students in the use of CAI.

h) Perform routine maintenance and report all major problems to Computer Curriculum Corporation.

i) Supervise Project Aide and instruct other staff in the use of CAI.

j) Oversee collection of all data related to CAI evaluation, especially test scores and attendance.

k) Write evaluation designs and project evaluations along with the Program Director and the Media Specialist.

It was the responsibility of the Project Aide to perform the following functions:

a) Enroll new students on CAI.

b) Instruct students in the use of CAI, orient them to the system and answer all questions related to CAI.

c) Observe and talk with students using CAI to gain feedback.

d) Perform routine maintenance including weekly back-up procedures.

e) Perform all steps necessary to receive weekly printed reports of student progress on the system.

f) Perform all record keeping regarding CAI students including attendance and progress on CAI.

g) Collect data needed for CAI evaluation.

In addition to the project staff, the Adult Learning Center's Media Specialist has become increasingly involved in certain aspects of CAI. Along with the Project Coordinator, the Media Specialist conducts and records group interviews to gain feedback on CAI. The Media Specialist is also very much involved in the writing of evaluation designs and project evaluations.

All Learning Laboratory staff have received ongoing orientation regarding the use of the system and are able to instruct students on the use of the system, answer their questions regarding CAI, and use CAI diagnostically to update student programs.

OBJECTIVES OF STUDY

Utilization

To provide weekly CAI utilization for a minimum of 150 ABE students (Experimental Group) each of whom will spend a minimum of five hours studying reading, language arts and/or arithmetic on CAI during the school year.

To provide CAI utilization for a minimum of at least 300 ABE and ESL students during the year as one component of their basic study program in reading, language arts and/or arithmetic.

Cognitive

To determine if Learning Laboratory students in the Experimental Group average gains of 2.5 years of growth or better in both reading and mathematics.

To determine if class students in the Experimental Group average gains of 2.0 years of growth or better in reading.

Affective

To determine if Learning Laboratory students in the Experimental Group average 50% more hours of attendance than those Learning Laboratory students who do not utilize CAI.

To determine if students utilizing CAI express positive attitudes towards CAI, towards learning and towards their rate of progress.

To determine if students utilizing CAI become more self directed in their learning styles, i.e., learn to use specific lessons on CAI to meet their particular needs and use CAI to diagnose other needs.

EVALUATION DESIGN

The 1982-83 study was designed to generate insight on the effect, both cognitive and affective, of Computer Assisted Instruction on ABE students. The study will concern itself with the following areas:

--- Extent of CAI utilization
--- Cognitive growth
--- Affective change

The study will include an Experimental Group made up of those students who utilize CAI for five or more hours during the year as part of their weekly study of reading, language arts and/or arithmetic. It will also make limited use of a Control Group of students who choose not to utilize CAI. Most elements of the study compare actual results to predetermined objective levels of performance.

I. Utilization

Records will be kept of the total number of students utilizing CAI as well as the total number of hours of utilization of each student in his/her study of reading, language arts and/or arithmetic.

Goal: To make Computer Assisted Instruction in reading, language arts and arithmetic available to the largest possible number of Adult Basic Education students in the Great Neck Adult Learning Centers. This goal will be considered to have been met it:

A. A minimum of 150 students utilize CAI for five or more hours during the year as part of their weekly study of reading, language arts and/or arithmetic.

B. A minimum of at least 300 ABE and ESL (English as a Second Language) students utilize CAI during the year as one component of their basic study program in reading, language arts and/or arithmetic.

II. Cognitive

Nationally recognized standardized achievement tests, (TABE) will be administered at the beginning and the end of the evaluation period as pre and post tests. Grade level equivalents on pre and post tests will be established and growth will be computed by the difference between the pre and post test scores.

Goal: To maximize cognitive growth among ABE students in reading and/or mathematics through the use of CAI. This goal will be considered to have been met if:

A. Learning Laboratory students in the Experimental Group average gains of 2.5 years of growth or better in both reading and mathematics.

B. Class students in the Experimental Group average gains of 2.0 years of growth or better in reading.

III. Affective

Records will be kept of the total number of hours of attendance of all Adult Basic Education students in the Learning Laboratories. All students utilizing CAI will complete an attitudinal questionnaire towards the end of the school year. Additionally, they will participate in ongoing group and individual discussion groups relative to their experiences with CAI. Data from these sources will be used in the affective element of the evaluation. (See Appendix #11)

Goal: To promote more sustained and meaningful contact with the learning center among ABE students through the use of CAI. This goal will be considered to have been met if:

A. Learning Laboratory students in the Experimental Group average 50% or more hours of attendance than those Learning Laboratory students who do not utilize CAI.

B. Students utilizing CAI express positive attitudes towards the use of CAI, towards learning and towards their rate of progress.

C. Students utilizing CAI become more self directed in their learning styles, i.e., learn to use specific lessons on CAI to meet their particular needs and use CAI to diagnose other needs.

MATCHED OBJECTIVES AND OUTCOMES

OBJECTIVES	OUTCOMES
Utilization	
To provide weekly CAI utilization for a minimum of 150 ABE students, Experimental Group, each of whom will spend a minimum of five hours studying reading, language arts and/or arithmetic on CAI during the school year.	A total of 170 ABE students were in the Experimental Group, which consisted of those students who utilized CAI for a minimum of five or more hours in their weekly study of reading, language arts and/or arithmetic.
To provide CAI utilization for a minimum of at least 300 ABE and ESL students during the year as one component of their basic study program in reading, language arts and/or arithmetic.	A total of 450 ABE and ESL students utilized CAI during the year as one component of their basic study program in reading, language arts and/or arithmetic.
Cognitive	
To determine if Learning Laboratory students in the Experimental Group average gains of 2.5 years of growth or better on standardized achievement tests in both reading and mathematics.	Learning Laboratory students in the Experimental Group averaged 3.71 years of growth in reading and 3.55 years of growth in mathematics. Lab Experimental Reading 3.71 Mathematics 3.55
To determine if class students in the Experimental Group average gains of 2.0 years of growth or better on standardized achievement tests in reading.	Class students in the Experimental Group averaged 3.32 years of growth in reading. Class Experimental Reading 3.32

OBJECTIVES	OUTCOMES
Affective	
To determine if Learning Laboratory students in the Experimental Group average 50% more hours of attendance than those Learning Laboratory students who do not utilize CAI.	Learning Laboratory students in the Experimental Group averaged 196 hours of attendance as compared to 108 hours of those Learning Laboratory students who did not utilize CAI. The Experimental Group had 80% more hours of attendance. Lab. Exp. Attendance 196 hours Non CAI Users Attendance 108 hours Difference 80% hours
To determine if students utilizing CAI express positive attitudes towards CAI, towards learning and towards their rate of progress.	Students utilizing CAI expressed very positive attitudes towards CAI, towards learning and towards their rate of progress. 98% "enjoyed" CAI. 73% feel"more confident" than before. 96% feel their progress is "OK" or "very good".
To determine if students utilizing CAI become more self directed in their learning styles, i.e., learn to use specific lessons on CAI to meet their particular needs and use CAI to diagnose other needs.	Students utilizing CAI became more self directed in their learning styles, i.e., learned to use specific lessons on CAI to meet their needs and use CAI to diagnose other needs. In courses offering a choice of lessons or topics: 77% of students chose lessons or topics to meet their particular needs Specific areas of improvement were identified by: 48% of respondents using reading courses. 70% of respondents using language arts courses. 88% of respondents using arithmetic courses.

FINDINGS

I. Utilization

Records were kept of the total number of students utilizing CAI as well as the total number of hours of utilization of each student in his/her study of reading, language arts and arithmetic.

A. Objective

To provide weekly CAI utilization for a minimum of 150 ABE students (Experimental Group) each of whom will spend a minimum of five hours studying reading, language arts and/or arithmetic on CAI during the school year.

Outcome

170 students utilized CAI for five or more hours during the year as part of their weekly study of reading, language arts and/or arithmetic.

	Goal	Actual	Objective Met?
Number of students in Experimental Group	150	170	Yes

Interpretations/Conclusions

The number of students utilizing CAI as a core part of their study of reading, language arts and/or arithmetic has grown every year, from 100 in 1978/79 to 170 in 1982/83. The Experimental Group consisted of 87 students from the Learning Laboratory and 87 from ABE classes. The results show that CAI has become an integral part of the Program for more students.

B. Objective

To provide CAI utilization for a minimum of at least 300 ABE and ESL students during the year as one component of their basic study program in reading, language arts and/or arithmetic.

Outcome

450 ABE, ESL, HSE and EDP students utilized CAI on a part time basis during the year either as one component of their basic study program or to meet specific needs in areas such as Survival Skills.

	Goal	Actual	Objective Met?
Total number of CAI users	300	450	Yes

Interpretations/Conclusions
The results show that very large numbers of students are utilizing CAI as at least part of their study program. The highly individualized nature of the system allows students to study only those courses, or even only those particular skills within certain courses, which meet their particular needs. As students learn to use CAI selectively, they get greater benefit out of relatively shorter periods of time on the system.

II. Cognitive

Nationally recognized standardized achievement tests, (TABE), were administered at the beginning and the end of the evaluation period as pre and post tests. Grade level equivalents on pre and post tests were established and growth computed by the difference between the pre and post test scores.

A. Objective
To determine if Learning Laboratory students in the Experimental Group average gains of 2.5 years of growth or better in both reading and mathematics.

Outcome
Learning Laboratory students in the Experimental Group average gains of 3.71 years in reading and 3.55 years in mathematics.

	Goal	Actual	Objective Met?
Lab Exp Reading	2.5 +	3.71	Yes
Lab Exp Mathematics	2.5 +	3.55	Yes

Interpretations/Conclusions
The data indicates that Learning Laboratory students who utilized CAI show dramatic rates of cognitive growth. Cognitive growth in 1982-83 was considerably higher than in previous years, especially in the area of mathematics. The increased growth in mathematics is probably the result of the increased use of fixed strands with students using CAI to drill on very specific skill areas.

B. Objective
To determine if class students in the Experimental Group average gains of 2.0 years of growth or better in reading.

Outcome
Class students in the Experimental Group averaged gains of 3.32 years in reading.

	Goal	Actual	Objective Met?
Class Exp. Reading	2.0	3.32	Yes

Interpretations/Conclusions
The data indicates that class students who utilized CAI also show dramatic rates of growth. It has been hypothesized in the past that CAI users from the highly individualized Laraning Laboratory show greater cognitive growth than CAI users from class environments because the diagnostic information yielded by CAI use is best utilized in an individualized setting. This year's growth among class students, which was greater than in previous years, probably reflects improved communication between CAI project staff and class teachers, and a growing ability among class teachers to individualize and meet specific needs within a classroom setting.

III. Affective

Records were kept of the total number of hours of attendance of all Adult Basic Education students in the Learning Laboratories.

All students utilizing CAI completed an attitudinal questionnaire towards the end of the school year. Additionally, they participated in ongoing group and individual discussion groups relative to their experiences with CAI. Data from these sources were used in the affective element of the evaluation.

A. Objective

To determine if Learning Laboratory students in the Experimental Group average 50% more hours of attendance than those Learning Laboratory students who do not utilize CAI.

Outcome

Learning Laboratory students who utilized CAI averaged 196 hours of attendance per student as compared to an average of 108 hours of attendance per student among non-CAI users - a difference of over 80%.

	Goal	Actual	Objective Met?
Lab Ex. Attendance		196 hrs.	
Non CAI Users Attendance		108 hrs.	
Difference 50%		80%	Yes

Interpretations/Conclusions

The data indicates that students who have the opportunity to utilize CAI attend school much more than students without the opportunity. This is consistent with findings in every other year of this study.

B. Objective

To determine if students utilizing CAI express positive attitudes towards CAI, towards learning and towards their rate of progress.

Outcome

Students utilizing CAI did express positive attitudes toward CAI, towards learning and towards their rate of progress.

a) 98% of respondents enjoy studying with the help of the computer.

b) 73% of respondents would like to utilize CAI more frequently than they are able to now. Only 5% would like to use it less frequently.

c) When given a choice of eight modes of study, 85% of respondents rated CAI among their three favorite modes of study.

d) 92% of respondents feel they have learned 'a great deal' or 'quite a bit' from using CAI.

e) 73% of respondents feel that their confidence has improved as a result of CAI use while only 5% feel less confident.

f) 96% of respondents rate their progress as either 'very good' or 'ok'.

g) 80% of respondents find CAI 'very helpful' in their classroom while only 3% feel it has not been very helpful.

h) 87% of students completing an attitudinal questionnaire responded when asked to list two things they liked most about studying with the computer. Only 26% responded when asked to list two things they liked least about studying with the computer.

Interpretation/Conclusion

From the above responses it is quite clear that the objective has been met. Students are overwhelmingly positive in their responses to CAI. More importantly, they express increased confidence in themselves and in their ability to learn. This finding has remained consistent since CAI was introduced into the Great Neck Adult Learning Centers and helps to explain the great rate of attendance and cognitive growth on the part of CAI users.

c. Objective

To determine if students utilizing CAI become more self directed in their learning styles, i.e., learn to use specific lessons on CAI to meet their particular needs and use CAI to diagnose other needs.

Outcome

Students utilizing CAI did become more self directed in their learning styles, i.e., they learned to use specific lessons on CAI to meet their particular needs and to use CAI to diagnose other needs.

In those courses which allow students to drill on specific skills:

67% of students utilizing "Fundamentals of English"
81% of students utilizing "Adult Arithmetic Skills"
86% of students utilizing "Survival Skills" and
100% of students utilizing "GED"
utilized particular lessons or drilled on specific skills to meet their particular needs.

In response to open ended questions asking students to identify specific skill areas in which they had improved as a result of using CAI, specific areas of improvement were identified by:

48% of respondents using reading courses
70% of respondents using language arts courses, and
88% of respondents using arithmetic courses.

Interpretation/Conclusion

Although this objective is relatively difficult to document, it seems clear from the above data that there is considerable movement towards self directedness of learning style.

Project staff placed great emphasis this year on teaching students how to choose appropriate lessons on CAI and on encouraging them to do so. The very high percentage of students who utilized CAI to meet specific needs helps to account for the high cognitive gains. The relatively lower percentage of students identifying specific areas of improvements reflects, in part, the limitations of expecting students to answer open ended, as opposed to multiple choice, questions. Observation and both individual and group interviews support the finding that CAI users do indeed pay attention to their areas of difficulty on CAI and strive to improve those areas in the Learning Laboratory or in their classes.

CONCLUSIONS AND RECOMMENDATIONS

Adult Basic Education students in the Great Neck Adult Learning Centers continued, in 1982/83, to benefit tremendously from their use of Computer Assisted Instruction. CAI is an ideal supplementary learning tool, especially when utilized within an individualized program utilizing a diagnostic/prescriptive framework. Students no longer consider CAI to be experimental or unusual. Project staff has continued to learn new and better ways of incorporating CAI into an instructional framework. Computer Assisted Instruction has truly become a core part of the Adult Basic Education program in the Great Neck Adult Learning Centers.

Those students in the Great Neck Adult Learning Centers who utilized CAI exhibited outstanding cognitive growth as measured by results of nationally standardized achievement tests in reading and/or mathematics. Students from the highly individualized Learning Laboratory who utilized CAI on a regular basis averaged gains of 3.71 years of growth in reading and 3.55 years of growth in mathematics. Students from classroom settings who utilized CAI on a regular basis averaged gains of 3.32 years of growth in reading. These gains are considerably higher than both statewide averages and preset goals.

There are a number of elements of Computer Assisted Instruction which help to explain the dramatic cognitive growth associated with its use:

.... CAI is individualized; that is, each student moves entirely at his/her own pace, totally unaffected by the performance of any other student.

.... CAI provides up-to-the-minute diagnosis of student's areas of strength and weakness, thus helping Learning Laboratory instructors and classroom teachers perform their tasks more thoroughly and efficiently.

.... CAI allows the student only a limited amount of time in which to respond to the questions presented. Most students find that this helps them to improve both their rate of comprehension and their ability to concentrate.

.... CAI, unlike most available print/audio media, provides the student with immediate feedback on his/her responses.

.... CAI utilizes a reporting system which provides the student with a clear picture of his/her progress.

Since the first year of CAI use, it has been clear that it has a very positive impact on cognitive growth when it is used properly. Perhaps even more significant are the affective changes which are associated with CAI use. Elements of the affective study lead to the conclusion that the following changes take place in CAI users:

.... Students who use CAI are more likely to perceive themselves as capable learners.

.... Students who use CAI become increasingly self directed in their learning style. They become more responsible for their learning and less dependent upon teachers.

.... Students who use CAI are able to identify for themselves specific skill areas in which they have improved, as well as areas in which they need improvement.

.... Students who use CAI can monitor their own scores and are able to see general progress.

This affective growth results in more rewarding learning experiences for students and helps to account for the improved cognitive growth and more regular attendance among CAI users.

The future of CAI use in the Great Neck Adult Learning Centers looks very bright. As the perception of CAI as being experimental and game like has diminished, it has become a much more effective learning tool. In order for CAI to continue to become increasingly useful to greater numbers of adults, emphasis on the following should be maintained:

1. Computer Curriculum Corporation should continue to develop new courses specifically for adult learners. Courses should be individualized, diagnostic/prescriptive, based on mastery learning, and allow the option of drilling on specific skills. The greatest need is for courses for beginning readers and English as a Second Language students. Computer Curriculum Corporation has developed courses for these students but, unfortunately, the courses require an audio component not presently available in the Great Neck Adult Learning Centers. A previous need for courses dealing with "functional skills" has been well met by the Survival Skills and Exploring Careers programs.

2. CAI project staff should continue to explore new and better ways to incorporate CAI into the instructional format. In order to utilize CAI's diagnostic/prescriptive capabilities to the fullest extent possible, CAI project staff has been working on:

   - compiling lists with topics and lessons to help students choose lessons according to their individual needs.

   - incorporating specific topics and lessons into the taxonomy for instructor's use in prescription writing.

   - developing more efficient ways of communicating diagnostic information to instructors.

   Improvements in these areas helped to account for the excellent cognitive growth in 1982/83. It is essential that CAI project staff continue to develop more effective means of utilizing CAI in order to maximize both student and staff time.

3. State Education Department officials and program directors should continue to find innovative ways to bring more terminals to Adult Learning Centers.

   - During the 1982/83 school year, project staff answered mail requests for information on CAI; consulted with numerous visitors, both present and potential CAI users, who wanted more information and/or experience related to CAI; trained the teaching staff of a New York City based ABE program; and organized, hosted and chaired a symposium of CAI users from various parts of New York State.

   - The Great Neck Adult Learning Centers is a regional center for CAI use with hook-ups at an elementary school in Great Neck where terminals are used by elementary school students in the day and adult students at night, and at adult programs in Brooklyn and Queens which have complete access to CAI.

   The above activites represent efforts to make CAI known throughout the state, to help people use it more effectively and to make it available to as many people as possible in a cost effective manner. Such activities should be continued and expanded.

Continued course development by Computer Curriculum Corporation, continued growth by CAI project staff and continued regionalization and coordination of resources will lead to more widespread and more effective use of CAI.

Computer Assisted Instruction has proven itself to be an invaluable component of an Adult Basic Education program. It is hoped that the experience and the recommendations of the Great Neck Adult Learning Centers will continue to have a positive impact on the development and expansion of Computer Assisted Instruction in New York State.